ABSTRACT

Methods are described for synthesizing stoichiometric LiBC and hole doped $Li_{1-x}BC$ (lithium borocarbide) according to heating processes, such as by both an arc-melting method and a sealed tantalum ampoule method.. The arc-melting method requires forming a pellet of uniformly-mixed elemental lithium, boron, and graphite and subjecting it to an arc-melt process sufficient to trigger a self-propagating exothermic reaction. Alternatively, the titanium ampoule method requires sealing uniformly-mixed elemental lithium, boron, and graphite (Li-B-C) in a tantalum ampoule; and heating under sufficient temperature for a sufficient period of time. Hole-doped $Li_{1-x}BC$ ($0 \leq x \leq 0.37$) can then be produced, such as through vacuum de-intercalation from the LiBC. According to the present invention, the hexagonal crystal lattice remains largely intact, with only slight decreases in lattice parameters upon hole-doping. The samples are intrinsically diamagnetic and are semiconducting in the 2 K to 300 K range studied.